

Impaired Water Identification Rule



Stakeholder Meeting #4
September 28, 2004

Meeting Topics

Purpose of today's meeting:

- Address remaining comments
- Review proposed changes
 - Binomial
 - Chronic Aquatic and Wildlife criteria – revised proposal
 - *E. coli*
 - Statistically derived standards
- Introduce draft conceptual rule language

Stakeholder meeting info is available at:

www.azdeq.gov/environ/water/assessment/index.html

Next meeting:

Draft rule meeting

October 14th – Room 145 – 3 pm

Assessments: What is our goal?

- Determine whether ANY PORTION of a reach or lake is impaired, and
- Determine whether it is impaired AT ANY TIME (provided the problem is persistent or recurring).

Comment 1:

How do we avoid unnecessary listings?

- The assessment process has been modified to ensure that a listing is merited, while also protective of the natural resources.
 - Credible data requirements (IWIR 602);
 - Binomial corrects for potential sampling error (IWIR new 604C);
 - Weight-of-evidence (IWIR new 604E);
 - To decide if enough evidence to support a marginal listing
 - Actions in watershed since data was collected,
 - Data age and quality, and
 - Critical conditions.
 - Specific exempted conditions (IWIR new 604F);
 - Extensive public review process for the 303(d) List; and
 - The regulated community is encouraged to provide monitoring data from surface waters receiving discharges.
 - Water quality data, and
 - Flow data.

Comment 2: How do we account for “unique conditions?”

- How does the binomial approach (or any assessment method) address:
 - Unique Arizona conditions,
 - Different waterbody types,
 - Flow and hardness variability, or
 - Species adaptability?
- The binomial and other assessment criteria are not affected by these conditions. They are addressed in other parts of the process.

Comment 2: How do we account for “unique conditions?”

- Assessments are based on a number of water quality exceedances, modified by the weight of evidence approach and exceptions specified in the IWIR.
 - **Assessments are not water quality studies.** The binomial is simply a statistical method to **account for a margin of error.**
 - If studies have been completed, the **weight-of-evidence approach, “natural background condition,”** and other exceptions in the IWIR provide the opportunity to not list.
 - **The TMDL investigation** should address unique Arizona conditions.
 - Surface water quality **standards** are modified as we learn more about Arizona’s unique conditions.

Comment 3: How do we determine "pollution vs. pollutant?"

- Delisting can occur if pollution is the cause of the problem, instead of a pollutant or a measured characteristic of a pollutant (D.O., pH).
 - "Pollutants" can be controlled through reductions in loadings of specific parameters.
 - "Pollution," as defined here, occurs when the designated use is impaired, but reductions in loadings will not solve the problem. That is, water is impaired due to the physical, chemical, or biological management of the surface water, and not due to pollutant loadings.
 - Example: A lake where the TMDL analysis reveals that nutrient loading reductions will **not** eliminate the low DO, high pH, and fish kills. The lack of water and flow through at the lake are the problems. It is the management of the lake.

Comment 4: Why are we proposing changes to the binomial?

- Different concerns expressed:
 - EPA overfiling does not justify changing the current rule (20 sample minimum and $>10\%$ at 90% CL).
 - Use a $>10\%$ “raw score” approach with no minimum number of samples as is discussed in CALM guidance.
 - ADEQ does not have the monitoring resources to support use of the binomial with a 20 sample minimum.
 - Support the proposed $>10\%$ binomial with a 95% confidence level and a 10 sample minimum, listing when 3 sampling events exceed.

Comment 4: Why are we proposing changes to the binomial?

- We believe our proposed binomial is **scientifically and statistically defensible and resource protective**.
 - It allows a **margin of error** to avoid unnecessary listings.
 - Our data must meet **credible data requirements** and we isolate spill data during the assessment process, so we do not need the 20 sample minimum Florida chose.
 - It **reduces the minimum sample size requirement**, making the minimum data requirements attainable with current resources.
 - Listings will occur when **3 sampling events exceed standards**, rather than waiting for the 10 samples to be collected.
 - EPA guidance (CALM, the 2004 Assessment and Listing Guidance, the new bacterial guidance) **advocates use of a statistical approach** to reduce listing error.

Revising the Binomial Approach

The **binomial approach** is applied to:

- Human health criteria to protect for recreation and consumption;
- Conventional standards (e.g., dissolved oxygen) to protect Aquatic and Wildlife; and
- Standards to protect agricultural uses.

Revising the Binomial Approach Impaired

EXISTING

Impaired

- Impaired if $>10\%$ at a 90% confidence level,
- Minimum of 3 sampling events,
- Minimum of 20 samples.

PROPOSED

Impaired

- Impaired if $>10\%$ at a 95% confidence level,
- Minimum of 3 sampling events,
- Minimum of 10 samples, unless sufficient exceedances have already occurred (3 exceedances).

Revising the Binomial Approach Attaining

EXISTING

Attaining

- Attaining if $<$ or $=10\%$ at a 80% confidence level,
- Minimum of 3 sampling events,
- Seasonal distribution

PROPOSED

Attaining

- Attaining if $<$ or $=10\%$ at an 85% confidence level,
- Minimum of 3 sampling events
- Seasonal distribution.

Revising the Binomial Approach Delisting

EXISTING

Delisting

- Attaining based on $\leq 10\%$ samples exceed at 80% confidence level (< 3 exceedances in 10 samples)
- Samples must account for critical conditions.

PROPOSED

Delisting

- Based on $\leq 10\%$ at 95% confidence level with reverse hypothesis. Attaining if 0 exceed in 27 samples
- Samples must account for critical conditions.
- If documented improvements, use attainment based on the $\leq 10\%$ at 85% confidence level.

Chronic Aquatic and Wildlife Standards Old Proposal

Chronic Aquatic and Wildlife criteria were established to protect aquatic life and wildlife from toxic contaminants during a 4-day exposure period.

In the existing assessment rules, impairment is based on >1 exceedance.

Chronic Aquatic and Wildlife Standards Old Proposal

Proposal last meeting for assessments based on chronic A&W criteria:

- Modified binomial approach (>10% exceedance at 95% confidence level -- Frequency of exceedances)
- Plus specific supporting evidence:
 - Magnitude of exceedances,
 - Duration of exceedances, and
 - Extent of the contamination area.

Problems:

- Not protective enough of aquatic life;
- Complicated assessments.

Chronic Aquatic and Wildlife Criteria New Proposal

New proposal for assessments based on chronic A&W criteria

- Grab samples will be used to represent chronic water quality conditions,
- Unless there is specific documentation that the grab samples do not represent chronic conditions.

Chronic Aquatic and Wildlife Criteria New Proposal

- When do grab samples not represent chronic conditions?
 - Exclude samples collected within the first 3 days of an event (e.g., high flow or spill).
 - Relating chronic conditions to stable flow conditions, then chronic conditions were occurring if flow records indicate stable flow **at the site for at least three days before the sample was collected.**
 - Documented if sample is collected at a gaging station.
 - Use field notes, database comments, staff reports, or other documentation to determine **whether samples were collected during the first 3 days of an event.**
 - Normally not known for ambient monitoring.
 - Spill data is used only for listings if remediation is not occurring or not effective.

Chronic Aquatic and Wildlife Standards New Proposal

Flow records:

- Elevated flow is not sufficient on its own. Need documentation of how long these conditions were occurring in relationship to sample collection.
- To be protective of resources, ADEQ will assume samples represent chronic conditions unless documentation is available that chronic conditions were not represented.

Chronic Aquatic and Wildlife Criteria Reconsidering the Binomial

- Re-examine the statistical and scientific basis behind making listing decisions using chronic A&W criteria based on:
 >1 exceedance in 3 years.

Chronic Aquatic and Wildlife Standards

The science behind chronic A&W criteria development:

Chronic A&W criteria are developed for a particular pollutant based on all available information concerning toxicity to, and bioaccumulation by, aquatic organisms.

If enough acceptable data on aquatic animals are available, a chronic criteria is established for that pollutant that should **protect aquatic life during a 96-hour exposure period**.

Chronic Aquatic and Wildlife Standards

EPA Technical Support Document (1991)

(Guidance for point source dischargers of toxic pollutants.)

- Excursions can occur **no more often than once in 3-years**. An ecosystem should be able to recover that often from a marginal criterion excursion.
 - Recovery periods may be longer than 3 years if:
 - Multiple minor excursions (frequency),
 - A single major excursion (magnitude),
 - Affected area is large (extent), or
 - Persistent pollutant (duration).

Chronic Aquatic and Wildlife Criteria Reconsidering the Binomial

The statistics behind assessments based on chronic A&W criteria:

- Binomial for most parameters:
 - Based on $>10\%$ of samples exceed
 - Impaired = $>10\%$ exceedance at 95% confidence level
- A binomial for chronic A&W criteria:
 - Based on >1 exceedance of the 274 4-day periods in 3 years
 - This is $1 \text{ of } 274 = 0.36\%$
 - Impaired if $>0.36\%$ samples exceed at 95% confidence level

Chronic Aquatic and Wildlife Criteria Reconsidering the Binomial

- Binomial for Chronic Criteria
 - Impaired if $>0.36\%$ at 95% confidence level
 - Using the Critbinom calculation in Excel
 - 2 to 215 samples – impaired if 2 or more exceed
 - 216 to 361 samples – impaired if 3 or more exceed

Therefore based on binomial to assess chronic standards, up to 215 samples > 1 exceedance should result in a listing.

Chronic Aquatic and Wildlife Criteria Reconsidering the Binomial

Do we ever have more than 215 chronic samples?

- In the 2004 assessment, the only assessment units with > 100 samples for chronic constituents:
 - French Gulch 107 metals samples
 - Mineral Creek 103 metals samples
 - Alamo Lake 144 ammonia samples
 - (SRP collected almost 300 dissolved metal samples on the Arizona Canal, and more than 100 on 2 other canals. However, A&W criteria do not apply to canals.)

Answer: Not likely.

Chronic Aquatic and Wildlife Criteria New Proposal

If we apply >1 exceedance in 3 years for assessments based on A&W chronic criteria:

- When is >1 exceedance in 3 years a marginal call?
- Does the weight-of-evidence approach in the IWIR provide us an opportunity to not list in these marginal assessments? (new subsection 604.E)

Chronic Aquatic and Wildlife Criteria New Proposal

- **Marginal chronic criteria assessments:**
 - If only 2 exceedances up to 215 samples, or 3 exceedances from 215-361 samples, etc.
 - If exceedances causing the listing occurred during obviously elevated flows, but documentation is not available to establish whether samples were collected during the first 3 days of high flow.

All Assessments

- For any marginal exceedances, ADEQ will evaluate supporting evidence of impairment:
 - Probable anthropogenic sources in the watershed;
 - Associated pollutants exceeding standards and number of sampling events with exceedances
 - DO, pH, nutrients, or
 - Copper, manganese, cadmium, or lead
 - Extent of impairment
 - Magnitude
 - More direct measurement of impacts (i.e., high mercury in fish)
- If there is supporting evidence, then we will list. If there is not supporting evidence then we will make the case to not list and target more monitoring.
- Proposal: Clarify these concepts in the weight-of-evidence approach in the IWIR (new 604.E).

Chronic Aquatic and Wildlife Standards Impaired

EXISTING (2004)

Impaired

- Impaired if >1 sampling event exceeded in 5 years.

PROPOSAL

Impaired

- Impaired if >1 sampling event exceeded in 3 years.
- Exclude data with documentation that samples do not represent chronic conditions.
- Review marginal listings to determine that listing is merited.

Chronic Aquatic and Wildlife Standards Attaining

EXISTING (2004)

Attaining

- Attaining if 0 sampling event exceeded standards in 5 years,
- Minimum of 3 sampling events,
- Seasonal distribution.

PROPOSAL

Attaining

- Attaining if 0 sampling events exceeded standards in 3 years,
- Minimum 3 sampling events,
- Seasonal distribution.

Chronic Aquatic and Wildlife Standards Delisting

EXISTING (2004)

Delisting

- Attaining if 0 exceed in 5 years.
- Sampling must account for critical conditions.

PROPOSED

Delisting

- Attaining if 0 sampling event exceeded in 3 years.
- Sampling must account for critical conditions.

Escherichia coli: Single Sample Maximum Standard

Existing:

Impairment

- Based on exceedances of standards:
 - Full Body Contact = 235 CFU
 - Partial Body Contact = 576 CFU

Proposal:

Impairment

- Based on exceedances of a **screening values**:
 - Full Body Contact = 300 CFU
 - Partial Body Contact = 750 CFU

(Results are reported as “most probable numbers” with a large margin of error.)

Escherichia coli: Single Sample Maximum Standard

Existing:

Impaired

- Impaired if >1 exceed in 3 years.

Proposal:

Impaired

- If large dataset (1 sample per week during the swimming season), impaired if >10% exceed screening value per site per year at 95% CL (the binomial approach).
- If not a large dataset, impaired if >1 exceedance of the screening value in 3 years.
- If distant sites, base impairment on exceedances of screening values per site.

Escherichia coli: Single Sample Maximum Standard

Existing:

Attaining

- Attaining if 0 exceed in 3 years,
- Minimum of 3 sampling events,
- Seasonal distribution.

Proposal:

Attaining

- If large dataset, attaining if $<$ or $=$ 10% exceed standard per site per year at 85% confidence level (binomial approach).
- If not a large dataset, attaining if 0 exceed standard in 3 years.
- If distant sites, attainment based on exceedances of standard per site.

Escherichia coli: Single Sample Maximum Standard

Existing Delisting

- 0 exceed in 3 years,
- Minimum of 3 sampling events,
- Seasonal distribution.
 - Sampling must account for critical conditions.

Proposal Delisting

- If large dataset, use binomial approach:
 - Minimum - $\leq 10\%$ at 95% CL (0 exceed standards in 27 samples)
 - If documented improvements, $\leq 10\%$ exceedance at 85% CL (min. 0 of 10 samples)
- If small dataset, 0 exceed standards in 3 years.
 - Sampling must account for critical conditions.

Escherichia coli

- Dropping Wet Weather Listing Exclusion
 - Proposal to exclude *E. coli* exceedances during wet weather or high flow conditions was not sufficiently resource protective.

Escherichia coli: Geometric Mean Standard

Existing:

- Assessments based on calculating a 30-day geometric mean

Proposal:

- Do not assess if already impaired based on single sample maximum.
- Calculate **monthly geometric mean** if at least 4 samples/month.
- Calculate **annual geometric mean**, if at least 4 samples in a calendar year.
- If analytical result is reported as "greater than" or "too numerous to count," **multiply result by 1.5** to determine geometric mean.

Escherichia coli: Geometric Mean Standard

Existing Impaired

- Impaired if >1 exceedance of a geometric mean within 5 years.

Proposal Impaired

- Impaired if **one or more** exceedance of a geometric mean within the last **3 years** of monitoring.

Escherichia coli: Geometric Mean Standard

Existing

- Attaining if 0 exceedance during 5 years.
- Delist if 0 exceedances in 5 years, with seasonal distribution.
 - Sampling must account for critical conditions.

Proposal

- Attaining if 0 exceedance in last **3 years** of monitoring.
- Delist if 0 exceedances in last **3 years** of monitoring, with seasonal distribution.
 - Sampling must account for critical conditions.

Acute Aquatic and Wildlife and Nitrate: "Acutely Toxics"

- Acute Aquatic and Wildlife criteria were established to protect aquatic life and wildlife from toxic contaminants during a 1-hour exposure period.
- Nitrate and Nitrate/Nitrite standards were established for waters used as a source of drinking water (especially susceptible babies)

No changes in assessment methods are being proposed for these criteria.

Acute Aquatic and Wildlife Criteria and Nitrate Standards for Domestic Water Source

Existing:

- Impaired if >1 sampling event exceeds criteria in 3 years.
- Attaining if 0 sampling events exceeds criteria in last 3 years of sampling. Minimum 3 sampling events, with seasonal distribution.
- Delist if 0 exceedances in 3 years. Minimum 3 sampling events, with seasonal distribution.
 - Sampling must account for critical conditions.

Proposal:

NO CHANGES

Statistically Derived Criteria

- **Nutrient Annual Mean**
 - Minimum of 2 samples per month and 3 months during a 12 month period. (Data only available if special investigation)
- **Nutrient 90th Percentile**
 - Requires at least 10 samples, taken at least 10 days apart, within 12 months. (Data only available if special investigation)
- **Flow-weighted average annual salinity in Colorado River**
 - Minimum sample size not established.
- ***E. coli* geometric mean**
 - Minimum of 4 samples per month for a monthly geomean,
 - Minimum of 4 samples within a 12 month period if annual geomean.

Statistically Derived Criteria

Propose changing listing requirement from >1 exceedance to one or more exceedance for these statistically-based standards.

- In most cases, a significant amount of data is needed to calculate one exceedance. **Minimum sample size requirements established within the standard.**
- Such statistics smooth out results so that a couple of exceedances are not over-emphasized. If you have exceedance of a mean or percentile, you have **shown that the problem is persistent** without need for " >1 ."
- As seen by talking with other states about applying a geometric mean for bacteria data, this is **consistent with standard methods used by other states.**

Statistically Derived Criteria

Existing

- Impaired if >1 exceedance.
- Attaining if 0 exceedances criteria.
- Delist if 0 exceedances in monitoring period, with seasonal distribution.
 - Sampling must account for critical conditions.

Proposal:

- Impaired if 1 or more exceedance.
- Attaining if 0 exceedances of criteria. (No change)
- Delist 0 exceed in monitoring period, with seasonal distribution. (No change)
 - Sampling must account for critical conditions.

Planning List

- IWIR establishes many reasons for placement on the Planning List:
 - TMDL effectiveness monitoring
 - On 1998 303(d) and does not meet IWIR credible data requirements
 - Insufficient data to determine whether impaired or not attaining
 - WQ standard has been exceeded but no longer meets criteria for impairment based on change in standard. Insufficient data to evaluate new standard.
 - Trend analysis indicates standards may be exceeded by next assessment
 - Exceedance due to pollution, not pollutant
 - Insufficient lab detection limit used when an appropriate detection limit was available
 - Expected to attain use by next assessment
 - Threatened

However, inclusion of the Planning List in the IWIR seems to suggest that waters scheduled for future monitoring must have a water quality problem.

Planning List

Concern when current IWIR was adopted - waters removed from the 1998 303(d) List would be lost. Planning List would track them. Also could serve as a "warning" that a water may be listed soon.

- However, we now track all waters assessed within the five categories: Attaining all uses, Attaining some uses, Inconclusive, Impaired, Not attaining
- This is a much more complete list than what is specified in rule. Almost all waters are scheduled for further monitoring:
 1. Impaired waters
 2. Fixed station sites
 3. Waters with nearly sufficient exceedances to be impaired
 4. Waters with at least one exceedance
 5. TMDL effectiveness monitoring
 6. Waters missing core parameters or sampling events
 7. Waters attaining all uses
 8. Waters lacking any data

Planning List

ADEQ proposes to **remove all material related to the Planning List from the IWIR**

- Planning List is not directly related to identification of impaired waters – it is a tool that we use to prioritize monitoring
- Removal would simplify rule and focus it solely on impaired water identification
- We will **not change our surface water tracking methods**
 - All waters monitored will be tracked through the years in the Integrated Report

Revisions to the IWIR

Main revisions proposed:

1. Revising the binomial,
2. Modifying assessment of chronic criteria,
3. Modifying assessment of *E. coli* data,
4. Removing planning list requirements,
5. Specifying requirements for delisting,
6. Simplifying and clarify language throughout,
7. Adding a few new definitions.

Revisions to the IWIR

Dropping the Planning List requirements allowed us to combine the old 604 primarily with 605.

Now 5 sections instead of 6:

- 601 – Definitions
- 602 – Credible data requirements
- 603 – General data interpretation requirements
- 604 – Evaluating an assessment unit for listing and delisting
- 605 – TMDL priority criteria for 303(d) listed assessment units

Revisions to the IWIR

601 – Definitions

New definitions:

- Acute A&W criteria
- Assessment unit
- CERCLA
- Chronic A&W criteria
- Critical conditions

Revised definitions:

- Attaining
- Designated uses
- Impaired
 - Combined old 7 and 11 as both are impaired
- Sampling event

Revisions to the IWIR

602 – Credible data requirements

TMDL may discuss use of data near detection limit

More details to come at next meeting

Revisions to the IWIR

603 – General data interpretation requirements

- A.1.c. -- How to handle “greater than” bacterial data
- A.4. -- Simplified language. Only real change was adding nitrogen and phosphorus single sample maximum values to the “worst case” category when data is combined.
- E. -- Moved in the delineation of an assessment unit from the old 604.B

Revisions to the IWIR

604 – Evaluating an assessment unit for listing and delisting

Totally reorganized. Combined the old 604 and 605, and added a couple of new concepts. Dropped the planning list.

- A. Review all data to determine if any portion is impaired and be sure exceedances are reoccurring.
- B. Review impaired waters listings at least every 5 years.
- C. Define exceedances in terms of narrative and numeric standards and screening values.
- D. Listing criteria.
- E. Weight of evidence approach.
- F. Exceptions (exclusions to listings).
- G. Delisting criteria.

Revisions to the IWIR

Substantial changes:

604.C – Added *E. coli* screening values concept.

604.D – Revised the binomial approach, chronic assessment criteria, the *E. coli* geometric mean, and listings based on <10 samples.

604.E – Improved the weight of evidence approach by adding extent of contamination and magnitude of exceedance to:

- Further support marginal listings or
- Support not listing when further monitoring is warranted.

604.F – Brought in concepts from the old 604 Planning List subsection. Also added an exemption for exceedances of chronic A&W criteria when documentation that chronic conditions were not occurring.

604.G – Two kinds of delisting: 1. attaining uses, 2. TMDL complete but still impaired. Also provided specific criteria for delisting.

Revisions to the IWIR

605 – TMDL priority criteria for 303(d) listed assessment units

Significant changes:

B.1.d – Clarified protection of T&E species

C. – Clarified that a few low priority factors take precedence over high priority factors.

D.5. – Clarified that the drought may delay some TMDLs.